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ABSTRACT

The audio-tutorial systems in earth science was developed at St. Petersburg Junior College in response to an unacceptable but not atypical student failure rate at the community college level. This description of the program includes: (1) history of program development, (2) use of student tutors, (3) experimentation with a student paced, mastery learning approach, (4) use of lecture tapes and transcripts, (5) comparison by sex in a self-pacing experiment, and (6) equipment employed. The audio-tutorial system resulted in a significant reduction in failure rate in the earth science course. (STS)

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A DECADE OF EXPERIMENTATION WITH THE AUDIO-TUTORIAL SYSTEM

Presented at the Ninth Annual Congress
For Individualized Instruction

Purdue University
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The audio-tutorial system in earth science on the Clearwater Campus of St. Petersburg Junior College was born of frustration due to low student success. Records kept since the campus became operational in 1965 showed that - on the average - nearly 40% of the students who attempted earth science received less than a "C" in the course. Grades ranged from W to D's and F's. The teaching staff could not accept the idea that this alarming rate was an occupational hazard - a consequence of the type of student that attends a community college. (Incidentally, however, the 40% figure is not peculiar to the earth science course, and still is an expected percentage in many of the survey science courses taught in many community and junior colleges).

The staff at St. Petersburg Junior College are highly professional and well-schooled, both in their disciplines and in the nature and practice of teaching. The emphasis at the community college is teaching students to learn.

Through literature searches and personal investigation, we soon became aware that alternative methods of instruction were available. We were most impressed with successes reported here atPurdue, at Lansing Community College, at the University of Buffalo, and at Syracuse University, who, among others were reporting success in achievement and student attitudes in courses offered in the AT format.

We applied for and received some seed grant money, traveled around a bit, made some notes as to how our system might be similar to other systems, and tried to recognize the differences. Then we were off!

Our first effort was very much like Dr. Postlethwaite's here at Purdue. We had a general assembly session, I.Q. sessions, and Independent Study Sessions. Our learning Center was open from early morning until evening. Staff (3 people) were busy their waking hours to try to do justice to the program.

Study materials were prepared by the staff. They included integrated lecture (taped) and laboratory experiences and instructional objectives a la Mager.

The results were very gratifying. Our W/D/F rate dropped dramatically during the first year - to about 19%. During the second year of operation, essentially the same format was maintained. The results were almost as exciting. Nearly 67% of the students enrolled achieved grades of "C" or better (23% W/D/F).

During the first year of operation, the AT experiment was performed only with a small group of randomly selected students. About 60 or so. During the second year, about 150 students were in the AT sections, and, once assigned, were allowed to change to the conventional lecture/demonstration if they wished. Most stayed in the section to which they were assigned.

During the third year of operation, all sections were made AT sections. This information was published in the course description, and students could still opt for traditional classes by taking the course at another campus or center. However, the enrollment continued to grow.

During the summer of 1971, two of the staff had the opportunity to travel to Cambridge to take part in the M.I.T. program on Personalized Systems of Instruction. Rather than emphasizing audio visual methods, these programs were based on written program materials. Dr. Ben Green and his staff prepared an especially good program on the soundness of self-pacing for students in the college's physics program. We found much food for thought in Dr. Green's program. One of the major factors that we came away with from the M.I.T. experience was that students could be used as proctors or tutors. Shortly thereafter, we began using student tutors in our program. Our tutors came from the population of students currently enrolled in the AT earth science program. There were students of greater-than-average ability who could move through the learning package, pass a test (with a 90, or 95% minimum score) and then work in the lab to assist their peers.

The tutor program allowed those students who could, to move rapidly through the program. Their reward was examption from several of the quizzes and from the course final exam. In return, the burden of staffing the AT lab was eased considerably.

Students readily accepted the tutors, and worked with them. Many of them preferred the tutor to an instructor, and eagerly interacted where they normally accepted coursework tacitly.

Grade distribution has not significantly changed since tutors have been brought in to share in the job of "manning" the earth science learning center. The W/D/F rate seems to have settled down to between 25 and 30 percent where it has remained for the past 6 years. (it has been suggested that early dramatic lows - less thant 20% were due to the impact of the experiment on the students; the so-called "Hawthorn Effect").

Late in 1972, we began thinking about the Mastery concept and how it might be applied to our AT program. The idea of mastery - that a student should be able to attain certain skills before he moved to another set of skills, was described by Bloom and others, and put into practice at the elementary school level by James Block, then, I think, a graduate student at the University of Chicago. Since our course objectives were performance based, we decided that test scores on unit quizzes would give a reasonable approximation of the student's level of mastery of the material. Thirty students were selected at random from the class rolls, and told that they could move through the learning packages at a rate consistent with their interests and abilities. That they must score a 90% on each quiz, and that their grade would be determined by the number of units completed: 14 or more for an A, 11 for a B, 9 for a C, or 7 for a D. There were to be no F's. Students that did not complete the course in one semester could sign up again, pick up where they left off and take as much time as they needed to complete the program. The only stipulation was that they work continuously. (a student could not be absent for an extended period).

Generally, this program was a flop. Tutors could not be used because most students were not at the same place as the regular class. All the resources of the program were required to be ready at the outset - one student completed the "semester" course in 4 weeks. Most in one session; some in a year. Some are still not done five years later. The entire set of audio and video tapes, demonstrations and films has to be made available for these students at all times! Further, instructor time was inefficiently used. Retests were difficult to prepare and schedule. Students often took tests they were not prepared for. The total man-hours necessary to operate the program for 30 students was equal to that for 150 students in the regular AT program. The outcome of this program was not significantly different than the AT, fixed-time program. Although there were few D's and no F's, about 1/3 of the class failed to complete the course. Of those that did, most received B. Almost an equal number received A. About 10 or 15% received C.

It seems that the program of mastery and independent, individualized study is the ideal. However, consideration for cost-effectiveness, and student pre-conceptions severely limit this approach.

In 1974 we began making written transcripts of our tape recorded lectures available to students. At first, these were placed on reserve at the campus library. Later, these were duplicated and placed on sale at the campus bookstore. The effect of this move was unexpected. Nearly 80% of the class say that they use the scripts. About half state that they use the script exclusively. The rest use a combination of script and taped lectures. The remaining 20% use the tapes exclusively. OK, now the big question - why?

Although we have little data on student's reading ability because placement pretesting has been abandonded for philosophical and/or financial reasons, we think that the answer lies on the speed and comprehension of the reading process as compared to the process of listening to taped lectures. Many of our students have what might be considered average reading comprehension. Perhaps it might be more appropriate to say that their comprehension is adequate for their desired goal - a grade in the course. However, a significant percentage of our student population would not be accepted at a four-year school. Their entry credentials, including their reading ability would be too low. We think that it is these students who benefit from the taped lectures - and combination of lectures and scripts.

I have found that students who use the tape exclusively also require more individual attention. However, it should also be noted that a comparison of grades among students that use either the scripts or tapes exclusively, and those that use a combination of both suggests no difference.

Last year, for purposes of re-evaluating independent study programs, a section of earth science was set up whereby students could work at their own rate through the packages. In addition to age of students and such high school scores as were available, comparisons were made by sex. Men and women in both fixed-time AT and autopaced AT programs were compared. Results showed that there was no difference between men and women in the fixed-time AT program. Differences did exist, however, between men and women in the auto paced approach with men significantly higher in achievement measures. Of course, the results of this experiment are preliminary, and much more should be done to identify the variables that are operational. However, it does suggest that care should be taken in the development of independent

study programs so that particular groups are not subtly discriminated against. In this particular case, it has been suggested that women are socially indoctrinated at a very early age to repress the behaviors of competition, independence and agressive behavior. Several authors have suggested that women may fail to fulfill their intellectual potential because of socially imposed stereotypes. This may be crucial in independent study classes.

The present system is the culmination of evolution to date. Our material has now been acquired by Cambridge Press. In the past, our general assembly sessions have been made up of 150 to 200 students. Movies and lectures were facilitated by this device, but little give-and-take could occur. Now, our G.A.S. numbers about 30 students (we have more G.A.S.'s rather than 1 or 2 of over 100). We still show movies, but now, some discussion can occur at these sessions. Students now also are required to make use of out-of-class activities such as filmstrips and video tapes at the campus learning center. The I.Q. sessions differ with the instructor. Sometimes a quiz/discussion format is used. Sometimes lecture/discussion. The number of students here - 8 to 10 - allows great flexibility for the individual instructor.

I.S.S. is about the same as it has always been, with the exception that many of the students use scripts instead of listening to tapes. Students may also check out cassette tapes from the library, so much of the work may be done elsewhere. However, students are still strongly urged to come to the learning center to work with the "hands-on" materials for each unit.

Let me turn now to a brief discussion of equipment. We still employ reel-to-reel tape players. We have had this equipment for the past 9 years, and have never experienced a major failure. We have also experimented with cassette players. Although the machines were satisfactory, tapes were often found missing. There is little demand from today's student for the reel-to-reel tapes.

Many of the 35 millimeter slides formerly used in the learning center have been replaced by photographs in the student's study guide. While photos are convenient, they have tremendously reduced our ability to make changes in the visual component of the AT system. We are considering future modifications to allow us to return to 35 mm slides on a limited basis.

Film loops have always been a part of our system. In the early years, we had difficulty with magnetic sound loop projectors. Our greatest success has been with silent loop machines.

Our learning center has grown from part of one large classroom to a 2-room suite. In all, 28 carrels are operational, and experiments and demonstrations are located strategically around the room. We tried an interesting experiment last year. In addition to the earth science course, we offered a physical geology lab and a botany lab in the center. This worked so well, that someday, we plan to enlarge the number of course offerings available with the present facilities.

In the original installation, we maintained a ratio of about 10 students per study carrel. It seems that 15 students per carrel is not unrealistic for a program that is completely on tape, and perhaps even 25 or 30 students per carrel in a system where transcripts are available to students, as is ours. Use of the learning center for similar courses can actually lower the total cost so that this type of instruction may be made available to students at every institution.

Some Conclusions

Generally, lecture/demonstration classes in science average about a 60% success rate for community college students. This success rate may be raised using AT or other alternatives (to traditional) delivery system.

The so-called Hawthorn effect is alive and well. It probably stems from the notion that kids have that they are, somehow, special people because of the experiment. Well, they are, and the Hawthorn effect ought not be a research anomaly, but a stated goal or outcome.

Peer-tutors are important and should be used wherever possible.

Self-pacing may achieve cognitive gain, but effective consideration may suffer for lack of group interaction, defined deadlines and instructor confusion.

Students have many learning styles - AT may serve some of them.

The involvement and excitement of the teaching staff is of the utmost importance to the success of the program.

The small group experience is crucial for the following reasons:

1. Students develop a group identity and allegiance
2. Discussion facilitates learning (each student must become a teacher).
3. Research has shown that students accountable on oral tests do better on written quizzes.

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